ECO Circle 2002

Environmental mark of
TÜV Rheinland Product Safety GmbH
for IT products

01.2002

Catalogue of criteria and requirements for approval
Display Monitors (CRT, Flat Panel Display),
Personal Computers, Keyboards and
Notebooks / Laptops

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Contents

1. Introduction **5**

2. Overview **6**

3. Requirements **8**

3.1 Safety **9**

3.2 Electromagnetic Compatibility (EMC) **10**

3.3 Ergonomics **13**

3.4 Noise emission **17**

3.5 Recycling **18**

3.6 Harmful Substances **20**

3.7 Energy Consumption **31**

4. Period of validity and prerequisite **34**

5. Catalogue of Requirements "Recycling of Used Office Equipment" **36**

6. Contact persons **51**

1. Introduction

Today's office work is not imaginable without computer support. Besides the steady increase of technical performance, the consideration of consequences for health and environment must be taken into account.

The aim is to minimize disturbing factors such as poor image quality and usability as well as the protection of resources and environment.

TÜV Rheinland's Berlin /Brandenburg testing laboratories with its highly qualified experts cover all aspects of IT product testing. All those product parameters with impact on health and environment can be verified.

IT products that meet the current state of the art in product quality can be awarded the quality seal "*ECO Circle".*

The *ECO Circle* makes obvious to consumers that all requirements with regard to technical safety, ergonomics and ecology are met for the product. These requirements, leaned on ISO 14024:1999, are subjected to continual adaption on up to date technology and standards.

IT products, which are labeled with the ECO Circle, are also in compliance with the test criteria of the EU eco-label.

Suggestions of interested associations or manufactures are welcome.

Cologne, January 2002

2. Overview

Criteria	Means of approval	PC [1]	Monitor		K Key-board	N/L Notebook / Laptop
			CRT	FPD		
Safety	compliance with EN 60950	☒	☒	☒	☒	☒
	and the X-ray Ordinance	☐	☒	☐	☐	☐
EMC	compliance with EN 55022, EN 61000-3-2, EN 61000-3-3 and EN 55024	☒	☒[2]	☒	☒	☒
Ergonomics	EK1-ITB 2000	☒	☒	☒	☒	☒
	ISO 9241-3	☒	☒	☐	☐	☐
	ISO 9241-4	☐	☐	☐	☒	☒
	ISO 9241-7	☐	☒[3]	☐	☐	☐
	ISO 9241-8	☒	☒	☐	☐	☐
	ISO 13406-2	☐	☐	☒[3]	☐	☒[3]
	prEN 50279	☐	☒[4]	☒[4]	☐	☒[4]
	2 PfG 1041	☒	☒	☒	☒	☒

Overview (continued)

Criterion	Means of approval	PC [1]	Monitor		K Key-board	N/L Notebook / Laptop
			CRT	FPD		
Noise	compliance with the limits of RAL UZ 78 RAL UZ 93	 ☒ ☐	 ☐ ☐	 ☐ ☐	 ☐ ☐	 ☐ ☒
Recycling	compliance with the requirements of chapter 3.6 in this document	☒	☒	☒	☒	☒
Pollutant reduced	compliance with the catalogue of requirements ”Harmful substances”	☒	☒	☒	☒	☒
Energy saving	compliance with limits of 1999/205/EC 1999/698/EC RAL UZ 93	 ☒ ☐ ☐	 ☒ ☐ ☐	 ☒ ☐ ☐	 ☐ ☐ ☐	 ☐ ☒ ☒
Quality system	certificate QMS ISO 9001 and UMS ISO 14001	☒	☒	☒	☒	☒

1) Personal Computer (System unit, workstation)
2) in addition some requirements in electromagnetic interference
3) minimum keeping Class II or Class I requirements of ISO 9241-7 / ISO FDIS 13406-2
4) Class A requirements

3. Requirements

Display Monitors, Personal Computers and keyboards must fulfill the following criteria with regards to safety, EMC, ergonomics, noise, recycling, harmful substances and low energy consumption.

In the document the following abbreviations are used:

PC	Personal Computer (system unit, workstation)
CRT	Monitor with CRT
FPD	flat panel display
K	Keyboard
N/L	Notebook / Laptop

Comment to compliance testing and Means of approval:

An accredited test laboratory is an organization which holds an official Means of approval that shows the qualification (e.g. according to the European Quality Standard EN 45001) to conduct compliance testing for the specified test standards.

3.1 Safety

3.1.1 Definition and Goal

The safety of a product is a primary requirement for protection of mankind against health hazards. All those electrical products being physically contacted by the user in the office must comply with fundamental safety standards for office machines.

3.1.2 Requirements

The requirements for the safety of electrically powered office machines are stipulated in EN 60950.

3.1.2.1 Electrical Safety

PC
CRT
FPD
K
N/L

Office machines must fulfill the fundamental safety requirements according to EN 60950.

Means of approval

The applicant of a product must substantiate compliance with EN 60950 by submittal of a valid test report issued by an accredited test laboratory or alternatively by presentation of the GS certificate of TÜV Rheinland Product Safety GmbH and the applicant must furnish proof of the X-ray Ordinance.

3.1.3 Standards and Sources

EN 60950:2000	Safety of Information Technology equipment - Office Machines
X-ray Ordinance /01.87	Ordinance about protection of X-ray § 5

3.2 Electromagnetic Compatibility (EMC)

3.2.1 Definition and Goal

EMC (***E**lectro**m**agnetic **C**ompatibility*) is a necessary property of information technology products, in order to ensure correct operation in an electromagnetic environment. The product must comply with the limits for *Electromagnetic Emissions (EME)*, to not disturb the correct operation of other products. Also the product must be immune towards the *Electromagnetic Interference (EMI)* induced by other products.

Since 1/1/96 the conditions of the EMC directive 89/336/EEC and amendments applied in Europe. Products can only be labeled with the CE mark (and be marketed) if they comply with the conditions of the EMC directive. In addition to the requirements of the CE mark information technology products should comply with additional requirements for electromagnetic compatibility in order to guarantee interference free operation in the office environment.

3.2.2 Requirements

The following requirements specify important features regarding interference emissions, interference stability and the CE labeling regarding electromagnetic compatibility.

3.2.2.1 Electromagnetic Emissions (EME)

PC
CRT
FPD
K
N/L

Compliance (conformity) with the requirements of the EMC directive, such as compliance with EN 55022:1998.

Further EN 61000-3-2:1995 + A1:1998 + A2:1998 + A14:2000 and EN 610003-3:1995.

3.2.2.2 Electromagnetic Interference (EMI)

PC
CRT
FPD
K
N/L

Compliance (conformity) with the requirements of the EMC directive, such as compliance with EN 55024:1998.

3.2.2.3 Special quality requirements for electromagnetic immunity

For the ECO Circle Display monitors and notebook/laptops must fulfill special requirements to interference stability:

CRT

1. Power-frequency magnetic field
   1A/m, 50Hz, with basic standard EN 61000-4-8:1993
   Performance Criteria "A"

$$Jitter[mm] \leq \frac{charakter\ size[mm]+1}{40}$$

character size between 16'- 31', preferred 22'.

Means of approval

The applicant must substantiate compliance with the requirements by submittal of a test report of an accredited test laboratory, such as TÜV Rheinland Product Safety GmbH.

3.2.3 Standards and Sources

EMC Directive 89/336/EEC	COUNCIL DIRECTIVE on the approximation of the laws of the Member States relating to electromagnetic compatibility (89/336/EEC)
EMVG:1998	German law, covering the electromagnetic compatibility of products
EN 55022:1998	Information technology equipment – Radio disturbance characteristics – Limits and methods of measurement.
EN 55024:1998	Product family immunity standard for IT equipment
EN 61000-3-2:1995 + A1:1998 + A2:1998 + A14:2000	Electromagnetic Compatibility (EMC) Limits for harmonic current emissions
EN 61000-3-3:1995	Electromagnetic Compatibility (EMC) Limitation of voltage fluctuations and flicker in low-voltage supply systems for equipment with rated current ≤16A
EN 61000-4-8:1993	Electromagnetic Compatibility (EMC) Power frequency magnetic field immunity test

3.3 Ergonomics

3.3.1 Definition and Goal

Work places intended for on-screen office work, require ergonomically designed monitors, personal computers and keyboards so that the communication between operator and machine can run smoothly. Therefore unnecessary load of the overall organism and the sense organs in particular must be minimized. This is achieved by a good image quality of the monitor, low emission properties (electromagnetic radiation and noise) as well as a user friendly operating manual.

The EU Directive 90/270/EEC and the German Ordinance for Protection Safety and Health for on screen work (BildscharbV) define fundamental ergonomic requirements for work utensils and work environment in the office. The international standard ISO 9241 explain these ergonomic requirements in further details for the system components of a visual display workplace.

3.3.2 Requirements

In addition to the minimal requirements for on-screen computer work places, ergonomically designed office equipment must comply with important ergonomic requirements for electromagnetic emissions, image quality and usability:

3.3.2.1 Personal Computer (PC)

PC	1. Compliance with the ergonomic requirements for on-screen computer work places according to EK1-ITB 2000 . 2. Compliance with the ergonomic requirements for image quality in conjunction with a monitor according to ISO 9241-3 and ISO 9241-8 or ISO 13406-2. 3. Design of the user manual following the recommendations and requirements of 2 PfG 1151/01.01.

Herewith personal computers fulfill the requirements of the German Ordinance for Protection Safety and Health for on screen work, item 1 and 3.

3.3.2.2 CRT

CRT

1. Compliance with the ergonomic regulations for on-screen computer work places according to EK1-ITB 2000 .
2. Compliance with the ergonomic requirements according to ISO 9241-3, ISO 9241-7(Class I, Class II) and ISO 9241-8.
3. Compliance with the limits for low frequency electromagnetic fields according to prEN 50279, Class A.
4. Operation friendliness of the display (adjustment of the display, including OSD) and design of the user manual following the requirements and recommendations of 2 PfG 1151/01.01.

Herewith CRT displays fulfill the requirements of the German Ordinance for Protection Safety and Health for on screen work, annex, item 1-5.

3.3.2.3 FPD

FPD

1. Compliance with the ergonomic requirements for on-screen computer work places according to EK1-ITB 2000 .
2. Compliance with the ergonomic requirements for image quality according to ISO 13406-2.
3. Compliance with the limits for low frequency electromagnetic fields according to prEN 50279, Class A.
4. Operation friendliness of the display (adjustment of the display, including OSD) and design of the user manual following the requirements and recommendations of 2 PfG 1151/01.01.

Herewith flat panel displays fulfill the requirements of the German Ordinance for Protection Safety and Health for on screen work, annex, item 1-5.

3.3.2.4 Keyboard

K

1. Compliance with the ergonomic requirements for on-screen computer work places according to EK1-ITB 2000 .
2. Compliance with the ergonomic requirements according to ISO 9241-4and for German layout additional DIN 2137.
3. Design of the user manual following the recommendations and requirements of 2 PfG 1151/01.01.

Herewith keyboards fulfill the requirements of the German Ordinance for Protection Safety and Health for on screen work, annex, item 8 and 9.

3.3.2.5 Notebook / Laptop

N/L

1. Compliance with the ergonomic requirements for on-screen computer work places according to EK1-ITB 2000 .
2. Compliance with the ergonomic requirements for image quality according to ISO 13406-2.
3. Compliance with the ergonomic requirements according to ISO 9241-4 and for German layout additional DIN 2137.
4. Compliance with the limits for low frequency electromagnetic fields according to prEN 50279, Class A.
5. Operation friendliness of the display (adjustment of the display) and design of the user manual following the requirements and recommendations of 2 PfG 1151/01.01.

Means of approval

The applicant must substantiate compliance with submittal of corresponding test reports by an accredited test laboratory or alternatively by submittal of the ”ERGONOMIE GEPRÜFT / ERGONOMICS APPROVED” certificate of TÜV Rheinland Product Safety GmbH.

3.3.3 Standards, Sources

EU Directive 90/270/EEC	COUNCIL DIRECTIVE on the minimum safety and health requirements for work with display screen equipment (90/270/EEC)
BildscharbV/20. 12. 1996	GERMAN ORDINANCE on safety and health requirements for on-screen computer work places
ISO 9241	Ergonomic requirements for office work with visual display terminals (VDT's)
ISO 9241-3: 1992	1992 Visual display requirements
ISO 9241-4: 1998	1998 Requirements for keyboards
ISO 9241-7: 1997	Display requirements with reflections
ISO 9241-8: 1997	Requirements for displayed colors
EK1 59/98 and 60/98	Ergonomics Requirements for IT Products in the context of the use with visual display units for the GS Mark testing
DIN 2137	Keyboards
prEN 50279: 1998	Computers and office machines Measuring methods for electric and magnetic near fields.
2 PfG 1151: 01.01	Test procedure "operation friendly monitors"
ISO 13406-2:2001	Ergonomic requirements for the use of flat panel displays

3.4 Noise emission

3.4.1 Requirements

The following limits for noise emissions ("declared sound intensity level L_{WAd}) measured according to DIN EN 27779 must be passed:

Product: / operation:	PC	N/L
during idle mode	48 dB(A)	48 dB(A)
during operating mode (of hard disk, floppy disk, CD-ROM disk or DVD disk, depending on that operation with the maximum result)	55 dB(A)	55 dB(A)

Means of approval
The applicant must substantiate compliance with submittal of corresponding test reports by an indepedant test laboratory.

3.4.2 Standards, Sources

RAL UZ 78: 01/99	Basic Criteria for the award of the environmental label - environmentally acceptable workstation computers
RAL UZ 93: 07/98	Basic Criteria for the award of the environmental label - portable computers
DIN EN 27779: 11/91	measuring of sound levels for machines

3.5 Recycling

3.5.1 Definition and goal

Recycling and reuse of products and product parts as well as reuse of materials ensures conservation of raw materials and energy and prevention of waste. Thus, office equipment must allow to be easily disassembled. The construction must allow easy accessibility to detachable connections. Composite material, which hinders the reuse is to be avoided. Use of abundant material shall also be avoided. Plastic parts must be appropriately marked and harmful parts must be easily removed. The manufacturer must allow for taking back the product after final use and ensure that the product or the material is being recycled.

3.5.2 Requirements

Recycling-constructed products must comply with specific requirements for construction, selection of materials, longevity, return as well as the way of packaging and documentation:

3.5.2.1 Recycling Inducing Construction

PC **CRT** **FPD** **K** **N/L**

Compliance with the requirements of the TÜV Rheinland Catalog of Requirements **"Recycling of Used Office Equipment".**

Means of approval

The applicant must substantiate compliance with the requirements by submittal of the test protocol "**Recycling of Used Office Equipment**" of TÜV Rheinland.

3.5.3 Standards and Sources

VDI Directive 2243:11/93	Constructing Recyclable Technical Products
DIN ISO 11469: 05/95	Plastics – Generic identification and marking of plastic products
ISO 1043 –1, -2, - 3, -4	Plastics – Symbols
RAL UZ 78: 01.99	Basic criteria for the Issuance of the Environmental Mark Environmentally acceptable Workstation Computers
EU Directive 93/86/EEC	Batteries and Accumulators containing hazardous substances
ISO 14001	Environmental management system
EU VO N0. 1836/93/EEC	COUNCIL REGULATION Ecology – Audit-decree
RAL UZ 93: 07/98	Basic criteria for the Issuance of the Environmental Mark Portable Computer
Packaging Ordinance: 08/98	Packaging Ordinance
1999/205/EC: 03/99	Comission Decision of establishing the ecological criteria for the award of the Community eco-label – personal computer
1999/698/EG: 10/99	Comission Decision of establishing the ecological criteria for the award of the Community eco-label - portable computer

3.6 Harmful Substances

3.6.1 Harmful Substances

Office machines must be designed in such a way that during operation or during reuse they don't present health threatening, odorous threatening or other environmentally risks.

3.6.2 Requirements

Product materials in housings and components containing harmful and health threatening substances must be minimized and avoided as much as possible. Odorous and hazardous venting during operation shall not appear.

3.6.2.1 Heavy metals in plastics including plastics of packaging

PC
CRT
FPD
K
N/L

For plastic substances it is not allowed to contain cadmium or lead accessories. The upper limit is 10 mg/kg.

Means of approval

The applicant must confirm the requirement. Spot checks are carried out by an accredited laboratory, e.g.:TÜV Produkt und Umwelt GmbH.

3.6.2.2 Halogenated polymers in plastics including plastics of packaging

PC
CRT
FPD
K
N/L

1. Following RAL-UZ 78 it is not allowed to use halogenated polymers, copolymeres or halogenated substances.

   Additives (e.g. anti- dripping- substances) with
   Flour content up to 0,5% mass or
   Brom content up to 0,2% mass or
   Chlor content up to 0,2% mass in the plastic are allowed.

2. Substances used shall not be assigned any of the risk phrases **R45, R46, R60 and R61**, as defined in Council Directive 67/548/EEC, last amended by Commission Directive 98/98/EG.

   Specially the substances Table 1: *"Harmful Substances: Flame retardants and contamination from flame retardants in housings".*

Means of approval

The applicant must prepare a list of all parts of the housing with a declaration of the sort of used flame retardands. The concentration of halogens of 1-2 parts of housing will be examined by an accredited laboratory, e.g.:TÜV Produkt und Umwelt GmbH.

3.6.2.3 Harmful Substances in liquid crystal displays

FPD N/L

Substances used shall not be assigned any of the risk phrases **R45, R46, R50, R51, R52, R53, R60 and R61**, as defined in Council Directive 67/548/EEC, last amended by Commission Directive 98/98/EG.

Means of approval

The applicant must prepare a list of the materials used in the LCD. Random tests are carried out by an accredited laboratory, e.g.:TÜV Produkt und Umwelt GmbH.

3.6.2.4 Harmful Substances in batteries

PC N/L

Batteries for the purpose of preserving data in case of a power loss and accumulators for power supply shall not contain more harmful Substances. The measurable limit is

1 mg/kg mercury
10 mg/kg cadmium
100 mg/kg lead

Means of approval

The applicant must submit a specification from the manufacturer of the battery. Random tests are carried out by an accredited laboratory, e.g.: TÜV Produkt Umwelt GmbH.

3.6.2.5 Harmful Substances in background lighting

FPD N/L

The background lighting of displays shall not contain more than the following values of mercury, depending on the screen diagonal:

4,0 + 0,5 mg maximum mercury per background lighting bulb.

Means of approval

The applicant must state the content of mercury. Random tests are carried out by an accredited laboratory, e.g.: TÜV Produkt Umwelt GmbH.

3.6.2.6 Harmful substances in capacitors

PC CRT FPD N/L

Capacitors containing PCB's are not allowed.

Means of approval

The applicant confirms this requirement. Random tests are carried out by an accredited laboratory, e.g.: TÜV Produkt Umwelt GmbH.

3.6.2.7 Health endangering gas emissions

PC CRT FPD N/L

There shall be no harmful gas emission during operation which could result from residuals of the plastics such as styrene, formaldehyde or other organic solvents.

The upper limits for the substances are 0,11 mg/m³ for styrene and 0,05 mg/m³ for formaldehyde.
Other organic solvents are rated according the concentrations given in the "1. Environmental survey, Bundesgesundheitsblatt 3/93". The value for 90% of the examined homes is approached.

This is tested in a test room according to RAL-UZ 62.

Means of approval
Health endangering gas emissions are examined by an accredited laboratory, e.g.: TÜV Produkt und Umwelt GmbH.

3.6.2.8 Odorous emissions

PC CRT FPD K N/L	There shall be no odorous emissions during operation. The test is carried out under conditions 3.6.2.7. The odor at normal operation conditions is tested by at least 5 persons and described standardized. The note 3 must be achieved (poor odorous emission).

Means of approval
Odorous emissions are examined by an accredited laboratory, e.g.: TÜV Produkt und Umwelt GmbH.

3.6.2.9 Packaging

PC CRT FPD K N/L	For fabrication of package it is not allowed to use fluorine hydro carbons, which can lead to a dismantling of the ozone layer. During the test based on headspace technic no FCKW's shall be measurable. The measurable limit is 200 mg/kg. Compare table 2 "substances dismantling the ozone layer".

Means of approval
The applicant must confirm the requirement. Spot checks are carried out by an accredited laboratory, e.g.: TÜV Produkt und Umwelt GmbH.

3.6.3 Standards and Sources

Chemical Prohibition Ordinance (ChemVerbotsV), Federal Law Register: 1993	Ordinance for the Prohibition and Restriction of the Distribution of Hazardous Substances, Preparations and Products according to the Chemicals Law
Methodensammlung [Collection of Methods]	Analytical Methods for Testing Health Endangering Agents, Air Analysis Published by: Deutsche Forschungsgemeinschaft
ZH1/120: 12/92	Recognized Analysis Procedures for the Determination of Concentrations of Airborne Cancer Causing Agents in the Work Environment Published by: Hauptverband der gewerblichen Berufsgenossenschaften
VDI Directive 3484 Page 1: 1979	Measuring Gaseous Emissions Measuring of Aldehydes
RAL UZ 62: 12/93	Basic criteria for the Environmental Mark Photocopying machine
RAL UZ 78: 01/99	Basic criteria for the Environmental Mark Workstation Computers
RAL UZ 93: 07/98	Basic criteria for the Environmental Mark Portable Computers
EU-Directive, 81/432/EEC	Testing of Vinylchloride
Ordinance (EU) No. 3093/94	Substances that Deplete the Ozone Layer, 15.12.1994
DIN V ENV 1122-1124,1995	Determination of Cadmium in plastics with the method of the wet decomposition
Council Directive 67/548/EEC	Council Directive of 27.06.1967 on the harmonization of the legal and administrative regulations governing the classification, packaging and designation of hazardous substances.
Com. Directive 98/98/EC	Commission Directive 98/98/EU of 15.12.98 on the 25th revision of Council Directive 67/548/&EEC on harmonization of the legal and administrative regulations governing the classification, packaging and designation in connection with technical progress.

1999/205/EC: 03/99	Comission Decision of establishing the ecological criteria for the award of the Community eco-label – personal computer
1999/698/EG: 10/99	Comission Decision of establishing the ecological criteria for the award of the Community eco-label – portable computer
SNV 195651	Determination of odour formation caused by equipment (sensory testing)
DIN 10955	Testing of packaging materials and types of packaging used for foodstuffs.

Table 1: "Harmful Substances: Flame retardants and contamination from flame retardants in housings"

Description	**CAS No.**
Polychlorinated Biphenyle and polychlorinated Terphenyle	
Trichlorinated and higher chlorinated Biphenyle (PCB)	1336-36-3
Polychlorinated Terphenyle (PCT)	61788-33-8
Monomethyldiphenyle	
Monomethyltetrachloridiphenylmethane (Ugilec 141)	76253-60-6
Monomethyldichloridiphenylmethane (Ugilec 121 or 21)	
Monomethyldibromdiphenylmethane (DBBT)	99688-47-8
Chloroparaffines	
Chlorinated alkanes	61788-76-9
Chlorinated paraffinoil	85422-92-0
Chlorinated normalparaffin (C > 10)	97553-43-0
Chlorinated alkanes (C10 - 13)	85535-84-8
Chlorinated alkanes (C14 - 17)	85535-85-9
Chlorinated paraffin (C > 17)	63449-39-8
Chlorinated alkanes (C18 - 28)	85535-86-0
Brominated flame retardants:	
Bromoform	75-25-2
2-Bromoethanol	540-51-2
Dibromostyrene	31780-26-4
1,5-Dibromopentanediol	36511-36-1
Pentabromophenole	608-71-9
Tetrabromophtalicacid anhydride	632-79-1
Tetrabromobisphenole-A (TBBA)	79-94-7
Tribromophenole	25376-38-9
Vinylbromide	593-60-2

Description	CAS No.
Dioxines and furanes:	
2,3,7,8-Tetrachlor-dibenzo-p-dioxin	1746-01-6
1,2,3,7,8-Pentachlor-dibenzo-p-dioxin	40321-76-4
1,2,3,6,7,8-Hexachlor-dibenzo-p-dioxin	57653-85-7
1,2,3,7,8,9-Hexachlor-dibenzo-p-dioxin	19808-74-3
1,2,3,4,7,8-Hexachlor-dibenzo-p-dioxin	39227-28-6
1,2,3,4,6,7,8-Hexachlordibenzo-p-dioxin	
2,3,7,8-Tetrachlor-dibenzo-p-furan	51207-31-9
2,3,4,7,8-Pentachlor-dibenzo-p-furan	57117-31-4

Description	CAS No.
1,2,3,7,8-Pentachlordibenzofuran	
1,2,3,7,8-Hexachlor-dibenzo-p-furan	57117-44-9
1,2,3,7,8,9-Hexachlordibenzofuran	
1,2,3,4,7,8-Hexachlordibenzofuran	
2,3,4,6,7,8-Hexachlordibenzofuran	
1,2,3,4,7,8-Hexachlor-dibenzo-p-dioxin	39227-28-6
1,2,3,4,6,7,8,9-Octachlordibenzo-p-dioxin	
1,2,3,4,6,7,8-Heptachlordibenzofuran	
1,2,3,4,6,7,9-Heptachlordibenzofuran	
1,2,3,4,6,7,8,9-Octachlordibenzofuran	
2,3,7,8-Tetrabromdibenzo-p-dioxin	
1,2,3,7,8-Pentabromdibenzo-p-dioxin	
1,2,3,6,7,8-Hexabromdibenzo-p-dioxin	
1,2,3,7,8,9-Hexabromdibenzo-p-dioxin	
1,2,3,6,7,8-Hexabromdibenzo-p-dioxin	
2,3,7,8-Tetrabromdibenzofuran	
2,3,4,7,8-Pentabromdibenzofuran	
1,2,3,7,8-Pentabromdibenzofuran	
Brominated additives	
Tetrabromoethane	79-28-7
1,1,2,2-Tetrabromoethane	79-27-6

Description	CAS No.
Pentabromoethane	75-95-6
1,2,3,4-Tetrabromoethane	
Tetrabromo-2,3-dimethylbuthan	
Oktabromohexadecan	30262-03-4
1,2,3,4,5,6-Hexabromocyclohexan	30105-51-0/1837-91-8
Tetrabromocyclododecan	30178-92-8
1,2,5,6,9,10-Hexabromocyclododecan	25637-99-4/3194-55-6
Hexabromobenzene	87-82-1
Pentabromobenzene	608-90-2
1,2-Dibromomethylbenzene	
Pentabromoethylbenzene	58-22-3
Pentabromoethoxybenzene	3278-85-1
Octabromodiphenylether	32530-52-0
Pentabromodiphenyl	1163-19-5
Pentabromodiphenylether	1163-19-5
1,2,4,5-Tetrabromo-3,6-bis(Pentabromophenoxy)-benzene	58965-66-5
Polybrominated Biphenyle (PBBS)	
Polybrominated Biphenylether (PBBES)	
Polybrominated Biphenyloxide (PBBOS)	

Table 2: ”Substances that deplete the ozone layer”

Formula	Description		Formula	Description
$CFCl_3$	CFC-11		$C_3H_4FB_3$	
CF_2Cl_2	CFC-12		$C_3H_4F_2Br_2$	
$C_2F_3Cl_3$	CFC-113		$C_3H_4F_3Br$	
$C_2F_4\ Cl_2$	CFC-114		$C_3H_5FBr_2$	
C_2F5Cl	CFC-115		$C_3H_5F_2Br$	
CF_3Cl	CFC-13		C_3H_6FBr	
C_2FCl_5	CFC-111		$CHFCl_2$	HCFC-21
$C_2F_2Cl_4$	CFC-112		CHF_2Cl	HCFC-22
C_3FCl_7	CFC-211		CH_2FCl	HCFC-31
$C_3F_2Cl_6$	CFC-212		C_2HFCl_4	HCFC-121

Formula	Description		Formula	Description
$C_3F_3Cl_5$	CFC-213		$C_2HF_2Cl_3$	HCFC-122
$C_3F_4Cl_4$	CFC-214		$C_2HF_3Cl_2$	HCFC-123
$C_3F_5Cl_3$	CFC-215		C_2HF_4Cl	HCFC-124
$C_3F_6Cl_2$	CFC-216		$C_2H_2FCl_3$	HCFC-131
C_3F_7Cl	CFC-217		$C_2H_2F_2Cl_2$	HCFC-132
CF_2BrCl	Halon-1211		$C_2H_2F_3Cl$	HCFC-133
CF_3Br	Halon-1301		$C_2H_3FCl_2$	HCFC-141
$C_2F_4Br_2$	Halon-2402		CH_3FCl_2	HCFC-141b
CCl_4	Tetrachloromethane		$C_2H_3F_2Cl$	HCFC-142
$C_2H_3Cl_3$([2])	1,1,1-Trichloroethane		CH_3F_2Cl	HCFC-142b
CH_3Br	Methylbromide		C_2H_4FCl	HCFC-151
$CHFBr_2$			C_3HFCl_6	HCFC-221
CHF_2Br			$C_3HF_2Cl_5$	HCFC-222
CH_2FBr			$C_3HF_3Cl_4$	HCFC-223
C_2HFBr_4			$C_3HF_4Cl_3$	HCFC-224
$C_2HF_2Br_3$			$C_3HF_5Cl_2$	HCFC-225
$C_2HF_3Br_2$			$CF_3CF_2CHCl_2$	HCFC-225ca
$C_2H_2FBr_3$			CF_2ClF_2CHClF	HCFC-225cb
$C_2H_2F_2Br_2$			C_3HF_6Cl	HCFC-226
$C_2H_2F_3Br$			$C_3H_2FCl_5$	HCFC-231
$C_2H_3FBr_2$			$C_3H_2F_2Cl_4$	HCFC-232
$C_2H_3F_2Br$			$C_3H_2F_3Cl_3$	HCFC-233
C_2H_4FBr			$C_3H_2F_4Cl_2$	HCFC-234
C_3HFBr_6			$C_3H_2F_5Cl$	HCFC-235
$C_3HF_2Br_5$			$C_3H_3FCl_4$	HCFC-241
$C_3HF_3Br_4$			$C_3H_3F_2Cl_3$	HCFC-242
$C_3HF_4Br_3$			$C_3H_3F_3Cl_2$	HCFC-243
$C_3HF_5Br_2$			$C_3H_3F_4Cl$	HCFC-244
C_3HF_6Br			$C_3H_4FCl_3$	HCFC-251
$C_3H_2FBr_5$			$C_3H_4F_2Cl_2$	HCFC-252
$C_3H_2F_2Br_4$			$C_3H_4F_3Cl$	HCFC-253
$C_3H_2F_3Br_3$			$C_3H_5FCl_2$	HCFC-261
$C_3H_2F_4Br_2$			$C_3H_5F_2Cl$	HCFC-262
$C_3H_2F_5Br$			C_3H_6FCl	HCFC-271

3.7 Energy Consumption

3.7.1 Definition and Goal

Office equipment can aid energy conservation and the protection of the environment by consuming its rated power only when in an active state such during data entry or displaying information. During passive operation, the product must switch automatically to a stand-by status, in which the energy consumption is minimized.

3.7.2 Requirements

The requirements for low energy consumption of office machines are:

3.7.2.1 Monitor Display

CRT	1. The monitor must enter a stand-by mode not exceeding a power of 10 W. This stand-by mode must be entered automatically after an (user adjustable) interval up to 30 minutes once the monitor is not in use (no keyboard input or mouse input, reception of messages etc.). Once the stand-by mode has been entered, any subsequent user input must return the monitor to normal operation within 3 seconds.
CRT FPD	2. The monitor must enter a sleep mode not exceeding a power of 3 W *. This sleep mode must be entered automatically within 30 minutes (once the monitor is in stand-by mode and no further use (no keyboard input or mouse input, reception of messages etc.)).
CRT FPD	3. It must be possible to disconnect the monitor from the mains.

* (European Decision 1999/205/EG: 03/99)

3.7.2.2 Personal Computer

PC

1. Automatically turn off
   The PC must enter a stand-by mode not exceeding a power of 27 W *. This stand-by mode must be entered automatically after a period of 30 minutes if the PC is not in use (no keyboard input or mouse input, reception of a message etc.).
2. Manual turn off
   The PC must not exceed a power of 5 W in sleep mode during connection to mains or if required in a low energy mode allowing data communication.

* (European Decision 1999/205/EG: 03/99)

3.7.2.3 Notebook/ Laptop

N/L

1. Automatically turn off
   The Notebook/Laptop must enter a sleep mode not exceeding a power of 5 W * during connection to mains. This sleep mode must be entered automatically after 15 min if the Notebook/Laptop is not in use for (no keyboard input or mouse input, reception of a message etc.).
2. Manual turn off
   The Notebook/Laptop must not exceed a power of 2 W in off-mode during connection to mains and 5 W, if required in a low energy mode allowing data communication, excepting during a charging process of the battery.

* (European Decision, 1999/698/EG: 10/99)

Means of approval

The applicant must submit a test protocol from an independent test laboratory according to above specifications.

3.7.3 Standards and Sources

Energy Star *Computer MOU (Version 3.0)*

German Energylabel (GED)	Award conditions for the energy efficient products
RAL UZ 93: 07/98	Basic criteria for the Issuance of the Environmental Mark – portable computers
1999/205/EC: 03/99	Comission Decision of establishing the ecological criteria for the award of the Community eco-label - personal computer
1999/698/EG: 10/99	Comission Decision of establishing the ecological criteria for the award of the Community eco-label – portable computer

4. Period of validity and prerequisite

As a quality label beyond mandatory requirements by law the ”ECO Circle” will be adaptive to progress in technology and new market demands. The approval criteria are under permanent review and will be modified, indicated with the yearly number in the label.

At that time, the manufacturer can apply for a retest to upgrade the license. The validation of the license is not limited.

Prerequisite for the ”ECO Circle” - approval is the fact that the applicant has implemented a quality system according to ISO 9001 or ISO 9002 for the production and an environmental management system according to ISO 14001.

5. Catalogue of Requirements "Recycling of Used Office Equipment"

Valid for:	**Personal Computers**	**(PC)**
	Monitors with CRT	**(CRT)**
	Flat Panel Displays	**(FPD)**
	Keyboards	**(K)**
	Notebooks/Laptops	**(N/L)**

03.2001

The requirements for ”Recycling of Used Devices” are accomplished, if a ”yes” was given for all Must-Requirements (M-Requirements) and 50 % of the Should-Requirements (S-Requirements).

Components containing hazardous substances are batteries/accumulators and all kind of LCD´s.

Remarks to the requirements which are printed in **bold** state the kind of documents and confirmations that the applicant must produce at the check of TÜV Rheinland Product Safety GmbH.

	Requirement	Module(s)	Cat.

A. Construction and Connecting Components

A 1	Are modules which must be separated for reusing easily separable or connected via separation aids?	Entire unit PC, CRT, FPD, K, N/L	M

Important connections are those especially between the case and the chassis or the chassis and the electronics modules (e.g. predetermined breaking points).

Easily separable means, to allow for fast disconnection with a few grips. The damaging of the part is acceptable, if the reutilization or deposition is not hindered. Separation aids can be plug connections or snap connections as well as predetermined breaking points.

It must be possible to separate the LC layer as one part.

A 2	Are components containing hazardous substances easily traceable, if need be marked and easily removable without heavy damage?	Entire unit PC, CRT, FPD, K. N/L	M

”Easy traceable” means to allow components to be found easily during disassembly without expert knowledge (not necessarily within the first step of disassembly).

”Easily removable” means with simple tools, without strong effort, easily reachable.

Damaging is not acceptable if hazardous substances can be emitted.

A 3	Are the connections to be separated easily traceable and reachable?	Entire unit PC, CRT, FPD, K, N/L	S

A 4	Can disassembling be done with all-purpose tools exclusively?	Entire unit PC, CRT, FPD, K, N/L	M

”All-purpose tools” stands for customary and generally obtainable tools (e.g. screw-driver). For the aeration of the tube specific tools may be used.

	Requirement	Module(s)	Cat.
A 5	Can all connections, which must be necessarily separated, be disconnected using no more than 3 different tools?	Entire unit PC, M, CRT, FPD, N/L	M

Connections, which must be necessarily separated include destructive and not destructive disconnections.

A 6	If screws are used for connections, which must be necessarily separated, than only recessed head screws or hexagon head screws must be used.	Entire unit, not monitors PC, K, N/L	S
A 7	Are there sufficient contact points as well as sufficient working space for employing disassembly tools?	Entire unit PC, CRT, FPD, K,N/L	M

Sufficient working space is needed for the execution of the tool´s separating movement (particularly important for snap connections).

A 8	Are all separable connection elements axially accessible?	Entire unit PC, CRT, FPD, K, N/L	S
A 9	Are sharp edged contours not in the range of required disassembly working space?	Entire unit PC, CRT, FPD, K, N/L	S

Only contours, which can cause health hazards during the dismantling, are considered.

A 10	Are at least half of the separable connections between plastic components plug connections or snap connections?	Case, chassis PC, CRT, FPD, K, N/L	S
A 11	Can disassembling be done by one single person?	Entire unit PC, CRT, FPD, K, N/L	M

	Requirement	Module(s)	Cat.
A 12	Can the supporting surface be maintained during the entire disassembly work?	Entire unit PC, CRT, FPD, K, N/L	S

For CRT monitors it is accepted to use two supporting surfaces.

A 13	Is the enclosure free from electronic modules?	Case PC, CRT, FPD, K, N/L	M
A 14	Is the enclosure free from other non-plastic parts?	Case PC, CRT, FPD, K, N/L	S

After the manual dismantling and separation the enclosure must be free of any parts, which do not consist of the same material as the enclosure itself. Problems may be caused especially by injected metal parts.

A 15	Is it easily possible to aerate the picture tube after removing the back of the case?	picture tube CRT	M

The aeration can generally be supplied through the anode plate or the pump inlet respectively, as long as the safety precautions are obeyed.

A 16	Are batteries at the end of life time exchangeable by the user without of changing the printed circuit board.	Battery PC, N/L	M
A 17	Did the manufacturer carry out a check disassembly, (e.g. according to A 1 - A 16) and prepare a disassembly report, which lists the weak points?	Entire unit PC, CRT, FPD, K, N/L	M

This document can be used as a checklist for the check disassembly.

The disassembly report must be submitted by the applicant.

A 18	Is the life time of batteries/ accumulators used for memory back up at least 10 years?	Battery PC, N/L	M

The confirmation letter of the manufacturer is required.

	Requirement	Module(s)	Cat.
A 19	Are accumulators used for the supply at least 500 times rechargeable?	accumulator N/L	M

The confirmation letter of the manufacturer is required.

	Requirement	Module(s)	Cat.

B. Selection and Marking of Material

B 1	Is the variety of materials forming components of similar function limited to one material and for covers limited to two materials?	plastic parts PC, CRT, FPD, K, N/L	M

”Similar function” means e.g. parts of the enclosure, keys, cables etc., which can be classified for a high level utilization. Known incompatibillities of materials must be recognized.

The applicant must prepare a list of all plastic components (duroplastics and thermoplastics) with a declaration of the used materials as well as the flame retardants including their individual masses.

B 2	Are all components made of one sort of plastics dyed uniformly or compatibly?	enclosure, chassis PC, CRT, FPD, K, N/L	S

Dyings are compatible, if one of the existing colors can be regained from the mixed recyclate, e.g. ABS components dyed light-gray and anthracite.

B 3	Is the enclosure made of not more than 2 different, easily separable kinds of plastics?	enclosure PC, CRT, FPD, K, N/L	M

B 4	Is the direct labeling of plastic components limited to a minimum (e.g. manufacturer)?	enclosure PC, CRT, FPD, K, N/L	S

Laser-produced labeling shall not be considered as printing!

B 5	Can existing stickers or labels be removed easily (e.g. water soluble adhesive) or is the sticker made of the same material as the surface?	enclosure PC, CRT, FPD, K, N/L	M

Labels regarding safety standards are not concerned. Those labels should be removable, but can leave some adhesive.

The applicant declares the kind of material of the stickers and if the used adhesive is water soluble.

	Requirement	Module(s)	Cat.
B 6	Can 90% of plastics and the metal parts in housing and chassis recycled as material?	Case, chassis PC, CRT, FPD, K, N/L	M

”Recyclable” stands for such material that allows material utilization of which can be done on an industrial scale and is therefore technologically and economically useful (e.g. copper, ABS etc.). ”High level” means that a recyclate can be achieved which is equivalent to the original material.

B 7	Is proportional use of recyclate allowed?	Case, chassis PC, CRT, FPD, K, N/L	S

This means that the specification of the producer does not exclude recyclate.

These specification or a written confirmation must be submitted by the applicant.

B 8	Have the plastic parts been labeled easily visible and durable according to DIN ISO 11469?	Plastic parts PC, CRT, FPD, K, N/L	M
B 9	If flame retardants has been used, is the flame retardant declared by means of a label according to ISO 1043-4?	Plastic parts PC, CRT, FPD, K, N/L	S
B 10	Have batteries/accumulators been labeled according to guide line 93/86/EEC?	Batteries/ accumulators PC, N/L	S
B 11	Has the material been selected and the selection been documented (e.g. according to B 1 - B 10)?	Enclosure, chassis PC, CRT, FPD, K, N/L	M

	Requirement	Module(s)	Cat.

A written record can be prepared e.g. by guidelines for the construction. For a product evaluation done by the applicant or producer this catalogue may be used as a checklist.

The documentation has to be submitted.

	Requirement	Module(s)	Cat.

C. Longevity and Expandability

C 1	Does the product have a modular structure?	Chassis PC, N/L	M

In a modular product structure the functional groups of the system are designed as modules.

C 2	Is the basic system ready for an expansion of the system performance, especially for memory expansion and higher processor performance?	All modules PC, N/L	M
C 3	Is the system ready to update graphics, exchange installed hard disk or floppy disk?	All modules PC, N/L	M
C 4	Does at least one free slot exist?	All modules PC, N/L	M
C 5	Are at least 50% of the modules constructed in the same way of comparable modules used in notebooks of the same generation and the same manufacturer?	All modules N/L	M
C 6	Is the product ready for use of processed modules and does the specification allow installation of such?	Chassis, electronics modules PC, N/L	S

C6 only applies for repairs or service situations and does not apply for new products.

The applicant must confirm the compliance with this requirement.

	Requirement	Module(s)	Cat.

D. Taking back

Only for delivery in Germany.

D 1	Has the manufacturer committed himself to take the units back after use or does he participate in a returning system?	Entire unit PC, CRT, FPD, K, N/L	M

It is sufficient to mention one location for the taking back, where units are distributed and where the label will be used.

The applicant must confirm the compliance with this requirement.

D 2	Does the manufacturer have opportunities for utilization at disposal?	Entire unit PC, CRT, FPD, K, N/L	M

The applicant can dismantle the used units by himself or he can commission a third party for this task. In case of a commission the applicant must ensure the quality of the utilization. A corresponding contract with the third party must be submitted.

”Sufficient qualifications” are certification on the basis of the ZVEI/VDMA-requirements, eco audit according to EU-Directive, QM-system according to DIN EN ISO 9000ff or ISO 14001, or certification on the basis of the German ”Entsorgungsfachbetriebeverordnung”.

The opportunities for utilization must be documented and submitted (e.g. by contracts). The proof of qualification must be submitted.

D 3	Is the unit labeled with an unambiguous bar-code, as well as type and serial number for optimum electronic data processing for taking back?	Entire unit PC, CRT, FPD, K, N/L	S

	Requirement	Module(s)	Cat.

E. Package and Documentation

E 1	Are the plastic materials used for packing labeled according to the packaging ordinance?	Packing PC, CRT, FPD, K, N/L	M
E 2	Are all parts of the packing designed for an easy material separation and utilization?	Packing PC, CRT, FPD, K, N/L	M
E 3	Are paper, pasteboards and cartons manufactured using at least 70 % waste paper?	Packing PC, CRT, FPD, K, N/L	S

The applicant must confirm the compliance with this requirement.

	Requirement	Module(s)	Cat.

F. User manual

The relevant parts of the user manual to the following requirements have to be delivered by the applicant:

F 1	Does the user manual inform about the changing of the battery?	PC, N/L	M
F 2	Does the User Manual give information about the opportunities of expansion?	PC, N/L	M
F 3	Does the manufacturer provide a guarantee of 3 years?	CRT, FPD PC, N/L, K	M
F 4	Does the manufacturer offer a service of 5 years for spare parts after the end of the production?	PC, N/L, CRT, FPD, K, N/L	M
F 5	Is the taking back free of charge for the user?	PC, CRT, FPD, K, N/L	S

see also requirement G3, page 48.

F 6	Does the manufacturer state the possibility of taking back after use in the User Manual?	PC, CRT, FPD, K, N/L	M
F 7	Does the manufacturer state the possibility of the taking back of batteries/ accumulators free of charge by the manufacturers or subsequent dealers or their agents in the User Manual?	PC, FPD, N/L	M

Only relevant when changeable batteries/accumulators are used.

	Requirement	Module(s)	Cat.
F 8	Is the documentation delivered with the unit printed on chlorine-free bleached paper as waste paper as possible?	PC, CRT, FPD, K, N/L	M
F 9	Does the product manual give information about energy consumption, hints to the enery modi, hints about disconnection from the mains and he shall underline that inactivation of such features can result in higher energy consumption.	PC, CRT, FPD, K, N/L	M

	Requirement	Module(s)	Cat.

G. For products that comply with the test criteria for the EU eco-label:

G 1	Does an environmental declaration (in conformity with the recommendations of ECMA's Technical Report 70) accompany the product?	PC, CRT, FPD, K, N/L	M

If an application for the EU eco-label is wanted the manufacturer has to supply the TÜV Rheinland Product Safety GmbH with the following declaration:

G 2	Is, for consumers clearly visible, the product or the packaging provided with the following text? *This product qualifies for the European Union Eco-label, because it is efficient with energy and is designed to facilitate upgrading, recycling and environmentally sound disposal.* *Additional information on how to minimise environmental impacts is given in the instruction manual.*	PC, CRT, FPD, K, N/L	M

G 3	Is the taking back free of charge for the user?	PC, CRT, FPD, K, N/L	M

6. Contact persons

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